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ExtremeVaR of South East Asian Stock Indices with Extreme Distribution- Based Efficiency

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Abstract

The paper examines extremeValue-at-Risk (extremeVaR) model using median with daily stock indices of selected South East Asian countries consisting of SET index (Thailand), KLSE index (Malaysia), FTSI index (Singapore), and JKSE index (Indonesia). Additionally, the experiment using extreme value theory (EVT) was tested by Generalized Pareto Distribution (GPD) which has the characteristics of cumulative distribution function (CDF), or just distribution function, describes the probability that a subjective-valued random. The output results indicated that using median of KLSE extremeVaR in Malaysia was the AEC efficient equity for investing in these markets.

***Keyword*: Second-order stochastic dominance (SSD); extremeVaR; AEC market indices; Generalized Pareto Distribution**

1. Introduction

The structure of AEC market indices is changing rapidly. AEC stock markets have becomes bigger in number, larger in size and more specialized. The research objective aims to evaluate the extremeVaR based

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on Generalized Pareto Distribution (GPD) of time-series daily returns on market indices by using median of in SET - Bangkok SET (Thailand), KLSE - Kuala Lumpur Composite Index (Malaysia), FTSI - Singapore Straits Industrial (Singapore), and JKSE -Jakarta composite Index (Indonesia), The empirical study focuses on extreme variation of daily returns on market indices of four selected AEC countries during the period of 1999-2012.

2. Extreme distribution - Based efficiency

The distribution-based approach usually equivalent definitions involving various modifications the cumulative distribution function and its inverse, such as integrated (inverse) CDF, quintiles and conditional value at risk.

For Peak Over Threshold or Generalized Pareto Distribution (GPD) method utilizes data over a specified threshold. Jiahn-Bang Jang (2007) defined the excess distribution as

$$F_h(x) = \Pr(X-h < x \mid X > h) = \frac{[F(x+h) - F(h)]}{1 - F(h)}$$

Where h is the threshold and F is an unknown distribution such that the cumulative distribution function (CDF)

Dentcheva and Ruszczyński (2003) introduced the following linear program with distribution-based stochastic dominance constraints.

$$\max f(\lambda) = E(X\lambda) \tag{1}$$

$$s.t. \sum_{k=1}^{n} \chi_{ik}\lambda_k + s_{ij} \geq y_i, \quad i, j = 1,\ldots,m \tag{2}$$

$$\frac{1}{m}\sum_{i=1}^{m} s_{ij} \leq v_i, \quad j = 1,\ldots,m \tag{3}$$

$$s_{ij} \geq 0, \quad i, j = 1,\ldots,m \tag{4}$$

$$\lambda \in \Lambda \tag{5}$$

Where $\upsilon_j \equiv E[(y_i - y)_+] = F_Y^2(y_j)$ is the expected shortfall of y.

The constraints from the function basically ensure that $E[(\alpha - X\lambda)_+] \leq E[(\alpha - y)_+], \forall \alpha,$ which equivalent to SSD dominant is of $x\lambda$ over y , see Dentcheva and Ruszczyński (2003, 2006) for more details. Another distribution-based test recently published in Kopa and Chovanee (2008) employs the conditional value at risk defined as

$$CVaR_\alpha(z) = E(z \mid z > VaR_\alpha(z)), \tag{6}$$

Where $VaR_\alpha(z)$ is the value-at-risk of z, that is $F_z^{-1}(\alpha)$

3. Data description

Daily returns on AEC market indices during period of 1999-2012 were collected as shown in Table 1 and

presented by graphically in Figure 1, Figure 2, Figure 3 and Figure 4.The Unit Root test was conducted based on the test developed by Phillips and Perron (1988) proposed a nonparametric method for scheming for higher order serial correlation in time series data

Table 1: Data description of coefficient of variation by using median on AEC market indices during period of 1999-2012.

Country	Standard Deviation	Median	CV	CV_{median}
Thai	0.008	0.0104	0.769231	76.9231%
Malaysia	0.0052	0.0073	0.712329	71.2329%
Singapore	0.0066	0.0091	0.725275	72.5275%
Indonesia	0.0076	0.0106	0.716981	71.6981%

4. Graphical

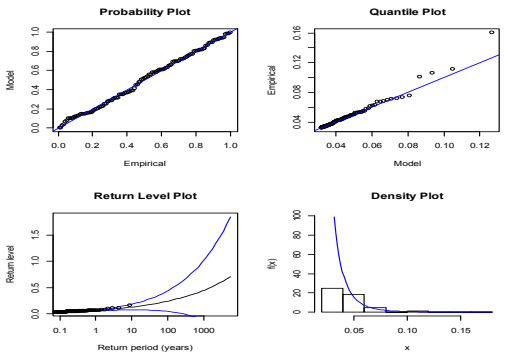

Figure 1. (a) ; Graphical presentation diagnostic plot of SET daily closing of stock-index returns during period of 1999-2012 by using GPD method

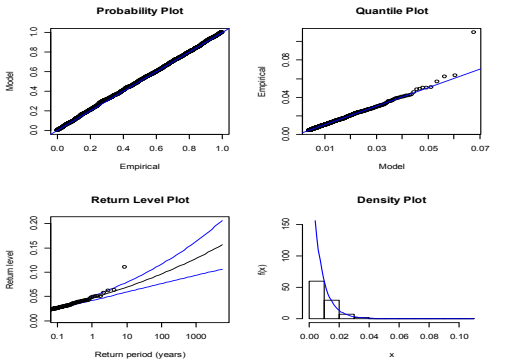

Figure 2. (b) ; Graphical presentation diagnostic plot of KLSE daily closing of stock-index returns during period of 1999-2012 by using GPD method

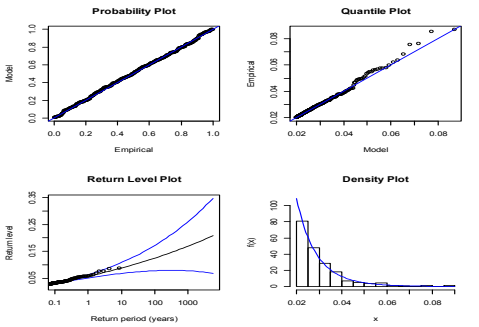

Figure 3. (c); Graphical presentation diagnostic of FTSI daily closing of stock-index returns during period of 1999-2012 by using GPD method

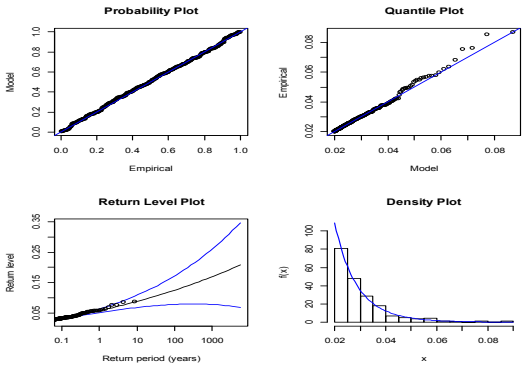

Figure 4. (d); Graphical presentation diagnostic plot of JKSE daily closing of stock-index returns during period of 1999-2012 by using GPD method

5. Research results

Table 2 Output Results of Phillip-Perron Unit Root Tests during period of 1999-2012

Equity Markets in AEC	With intercept and trend At Level	Critical Value At Level	Order level At Level
SET	-54.98834	-3.960906	I(0)
KLSE	-49.11382	-3.960889	I(0)
FTSI	-55.87696	-3.960834	I(0)
JKSE	-50.53239	-3.960920	I(0)

Note. Significant at 1% level; source: From computed

The results of Phillip-Perron unit root tests confirmed daily returns of SET, KLSE, SSE, and JKSE. However, the empirical study found evidence for the non-existence of a unit root *I(0)*. The null hypothesis of Phillips-Perron test is the proposition that implies no effect or no relationship between daily returns for the null hypothesis that x has a unit root *I(1)* against a stationary *I(0)* alternative across four national equity indices to assess intra-daily volatility dynamics in AEC as shown in Table 2.

The findings indicated evidence intra-daily effect from market to market of four AEC national equity

markets. A conclusion of four AEC diagnostic plots for the threshold model are shown in figure 1,2,3 and 4 that results including SET, KLSE, FTSI, and JKSE. These mean the accuracy correspondences to each the probability plot and quintile plot is unconvincing because the curve is about linear. In addition, the return level illustrates the large certainties that correspond exactly to the model.

The extremeVaRs result using median by Generalized Pareto Distribution (GPD) covered five period of intra-yearly volatility 2014- 2018 as depicted on table 1. Assessment of relative extreme returns of frequency models used empirical Generalized Pareto Distribution (GPD) model calculed median of daily returns natural log of stock based on threshold method as depicted on Table 1. Results of extremeVaR characterized that the Kuala Lumpur Composite Index (KLSE) of Malaysia was the most efficiency for decision-making under risk of investors which CV_{median} equal 71.2329%. Additionally, the subordinate of extremeVaR were Jakarta Composite Index (JKSE) of Indonesia, Singapore Straits Industrial (FTSI) of Singapore and SET Index of Thailand that equal 71.6981%, 72.5275% and 76.9231 respectively.

6. Conclusion

Writing a study of extremeVaR methods by using median of returns on AEC market indices raises a question regarding the scope of the efficiency of relative extreme returns for the selected period of the study. Results indicate that forecasting methods based on GPD model covered three parameters μ, σ and ξ, typically, models for the presence of evidence for the predictability of relative extreme returns and the existence of a 'gainer-loser' effect from market to market. Secondary data was used to produce evaluating of the returns covering the five-year period 2014-2018 on AEC market indices of SET, KLSE, FTSI, and JKSE. This original paper presents the first experimentation introduced extremeVaR of selected four national equity markets in extreme value estimators. According to computed output results, statistical techniques confirmed that a change in percent KLSE or Kuala Lumpur Composite Index (Malaysia) was the best efficiency for investment in ASEAN Economics Community or AEC.

Research results during this period confirmed the best forecasting method based on the boundaries of the term GPD model that covered three parameters μ, σ and ξ. For the best equity market in AEC, KLSE was the equity market because CV_{median} of KLSE equal 71.2329% which is the best value if compare with others.

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